

FUTURE COMBAT SYSTEMS: A BIG IDEA

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Introduction

Which came first, the chicken or the egg? With Future Combat Systems (FCS), it is also hard to know which comes first. Is it technology driving concept or concept driving technology? In part, the answer to this question lies with Bran Ferren, former Walt Disney Imagineering President for Creative Technology. Ferren, an Army Science Board member, postulated that the Army could use simulation to infuse greater innovation into the process of equipping the soldier. He referred to his concept as the "Big Idea," and suggested that true leap-ahead innovation is not achieved through a requirements process.

Ferren further suggested that there are two kinds of people in the world: Big-Idea people, who think in terms of broad, sweeping concepts; and Requirements people, who are proficient at applying specificity. According to Ferren, innovation tends to come from Big-Idea people, and it is the Requirements people who focus the discipline and ingenuity to bring the Big Idea to fruition. The trick is to bring these two types of people together, and simulation is a way to do it.

The Big-Idea approach is one of having a vision, creating a mock-up (in part through simulation), testing it, then repeating the process to apply lessons learned. This approach is different from starting with a requirements document and building to those requirements; this approach allows requirements to be tested and refined as necessary to achieve the Big Idea.

FCS

FCS is a Big Idea in more ways than one. First, FCS is a Big Idea in that the Army Chief of Staff proposes deploying the capability of a heavy digitized force anywhere in the world within 96 hours. FCS is also a Big Idea because it is executing the approach described above in partnership with the Defense Advanced Research Projects Agency (DARPA). Basically, the DARPA/Army partnership started with a "blank sheet of paper"; there will be no Operational Requirements Document until 2003. This is a dicey proposition because of the difficulty keeping everything in perspective, i.e., which comes first—technology or concept?

The truth of the matter is that both concept and technology are drivers, and the Big-Idea approach enables FCS to exploit both. Through the use of simulation, the Army Training and Doctrine Command (TRADOC) and the four FCS contractor teams are simultaneously exploring different operational concepts and technology mixes. Because of promising new technologies, different force structures, ways of fighting, and mixes of organic and "reachback" capabilities are being considered. On the other hand, technology requirements and developments are being shaped because of the range of missions and environments in which FCS is expected to operate. All of this really means FCS is exploring an extremely large trade space, and simulation is a key enabler.

One reason FCS encompasses such a large trade space is the third Big Idea. FCS is not a single platform

but a "system-of-systems"—something else the Army has never really done with this magnitude. Take into account that contractors will conceive, design, and build a system-of-systems, and the scope of the trade space becomes evident. This system-of-systems will be complete with new force structure; doctrine; tactics, techniques, and procedures; some level of embedded training capability; training simulations; and hooks to operate with legacy, joint, and coalition forces. The FCS will face tremendous challenges because of the sheer magnitude of the undertaking and because of the new ground being broken, both in terms of a new way of fighting (i.e., network centric) and the way in which the Army is acquiring FCS.

SMART

One strategy being used in the FCS Program is the Simulation and Modeling for Acquisition, Requirements and Training (SMART) concept. SMART enables the program to address systems development from a cost, schedule, performance, operational effectiveness, and training perspective from the beginning. The FCS Program will make use of a collaborative integrated data environment (IDE) and digital product descriptions (DPDs) to facilitate the simulation needs of various integrated product teams (IPTs) and working groups.

Because of the scope and magnitude of FCS, Program Manager (PM) LTC Marion Van Fosson established several IPTs to address specific aspects of system development ranging from operational considerations, to technical considerations, to systems considerations. These IPTs are comprised of subject matter experts (SMEs) from throughout the Army, including the research, development and engineering centers; HQDA; the Army Corps of Engineers; and the Combined Arms Support Command. PM, FCS also established a Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Tiger Team to assess proposed network concepts, sensor mixes, and command and control structures.

Relative to DARPA, PM, FCS established an experimentation effort as a means for DARPA to take developing technologies "out for a spin" to

determine not only their potential contribution to FCS effectiveness but also their limitations.

The confluence for all these efforts is modeling and simulation (M&S). Simulation needs of the IPTs, the Tiger Team, and DARPA experimentation overlap. Not only do the same tools serve different IPTs and working groups, but output from the analysis and experimentation conducted by one IPT or working group feeds the efforts of the others. The same can be said for the activities of the contractor teams and the FCS TRADOC Systems Manager. Establishment of the collaborative IDE and, in the future, the DPDs, will assist in meeting the needs of the FCS "M&S consumers" in an efficient and cost-effective manner.

Collaboration Environments

To enable these moving parts to work in synchronicity, the FCS Program personnel are working to establish the Future Combat Collaborative Environment (FCCE). FCCE is tailored to address those concerns of M&S consumers and, when the time comes, the test community. For FCS, the FCCE is defined as a loose collection of models and simulations; SMEs both from the M&S perspective as well as the technology and operational perspective; the standards that enable interoperability; the government-furnished mission scenarios and threat representations; and the processes by which verification, validation, and accreditation; M&S ownership and access; and configuration management are executed.

Contractors are encouraged to establish a similar environment to meet their needs: the design, engineering, manufacturing collaborative environment (DEMCE). Because their activities are different from the government (i.e., they actually execute the design, engineering, manufacturing, and technology trades), their M&S tool suite, standards, and processes differ. When the same tools can meet the needs of both FCCE and DEMCE, they are shared between the government and contractor teams. The contractors are encouraged to make use of government-furnished tools, but they are also employing their own tools. When the time comes to evaluate con-

tractor concepts and designs, the objects that comprise the contractor-developed DPD will be imported into a government-furnished environment and exercised using government scenarios, threats, and tools.

At the time of this writing, the FCCE and DEMCE are still works in progress. Initial success has already been achieved as part of the first phase of the program. TRADOC Analysis Centers (TRACs), in conjunction with the IPTs, have worked with contractors to represent and exercise their proposed concepts in the Combined Arms And Support Task Force Evaluation Model (CASTFOREM) and the Joint Army Navy Uniform Simulation (JANUS). The partnering was facilitated by first releasing the tools to the contractors through Memorandums of Agreement that stipulated rules for configuration management, data access, approaches for representing technologies, and C4ISR that were not previously accommodated in the tools. The contractors use the tools to refine their concepts, then bring them to TRAC to ensure required modifications are appropriate and acceptable. These simulation runs provide the government and the contractor teams better understanding of the concepts.

The key to determining what is brought into the collaborative environment is identifying concerns and their associated metrics, designing the analysis or experimentation to resolve those concerns, and "crosswalking" to M&S tools. The crosswalk involves identifying tools that may potentially support the analysis or experimentation and assessing the limitations of the tools to determine what modifications are needed so the tools can be used for the proposed application (as a last resort, new tools will be developed).

Framework

To ensure traceability between analysis and experimentation, a common framework was needed that accounted for the varied perspectives of the IPTs, working groups, etc., and to ensure integration across the advanced concepts and requirements; research, development, and acquisition; and training, exercises, and military operations M&S domains. This

framework was borrowed from the work of BG Huba Wass de Czege (USA, Ret.), member of the FCS Senior Advisory Group. In short, combat power is formulated as a function of firepower, maneuverability, and protection—all multiplied by leadership. Each of these elements can then be decomposed to greater levels of resolution. It provides a very effective bookkeeping methodology to account for all the doctrine, organization, training, leader development, materiel and soldiers. Using this framework allows the M&S crosswalk to accommodate a SMART approach. Because combat power is defined not only in terms of technology but also in terms of doctrine, tactics, training proficiency, and leadership, it provides a traceable way of cutting across all the concerns of the three M&S domains.

Conclusion

Just as the Army transformation is about fighting differently with different equipment, the successful fielding of FCS is about conducting combat development and materiel development differently than in the past. The Big Ideas being pursued as part of the FCS effort hold promise that the right changes are taking place to meet the challenge of the Army transformation. With successful fielding of FCS in 2012, the Army will prove it is well on its way to the objective force and that it has the right processes for bringing together the Big-Idea people and the Requirements people. Capturing the synergy between these groups is important because people make Big Ideas happen.

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